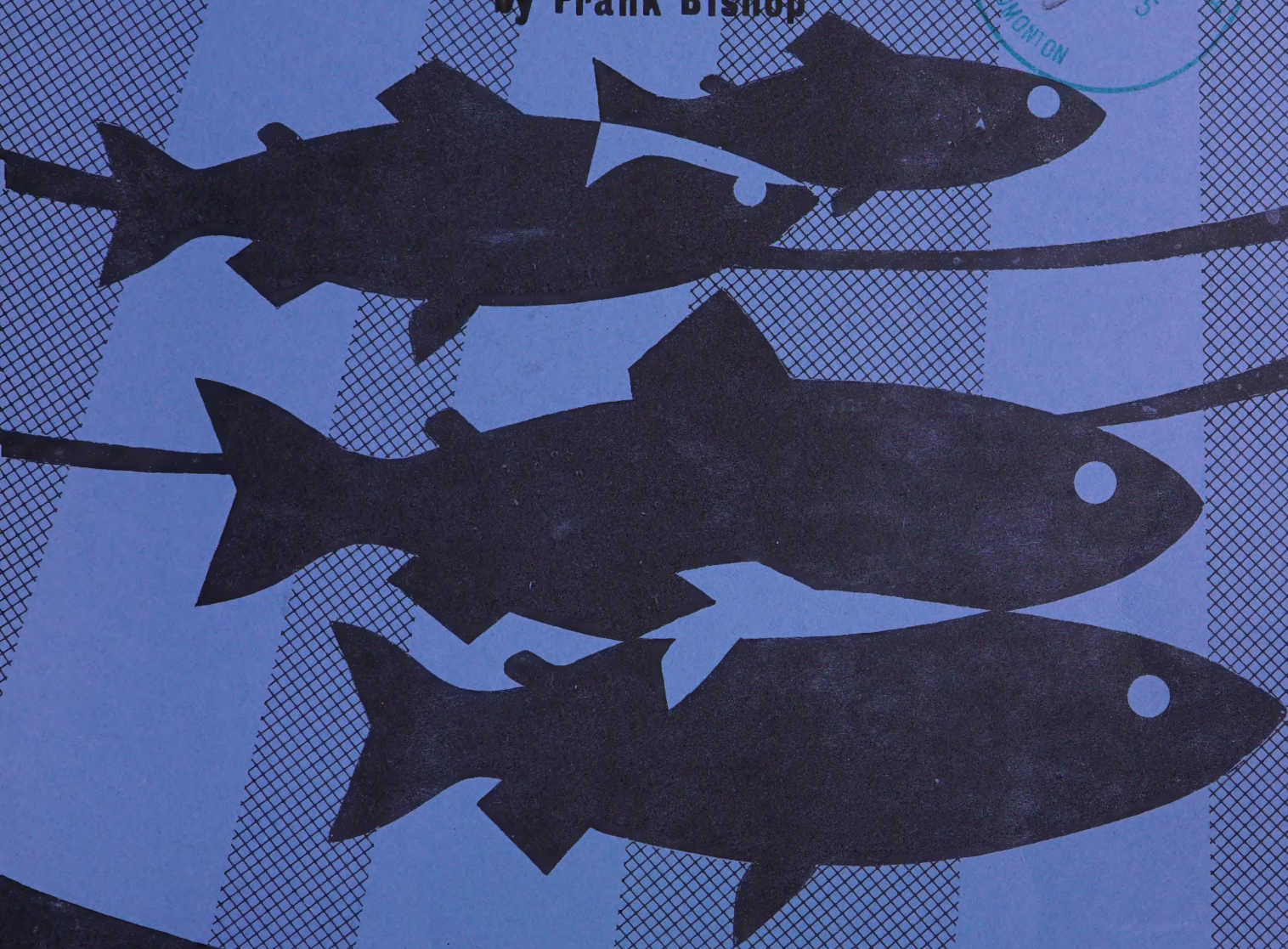
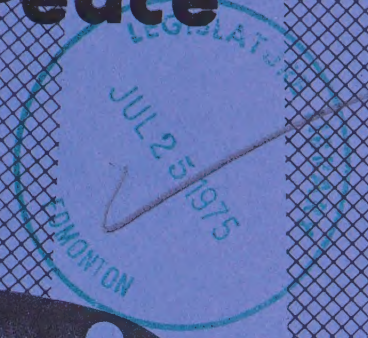


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Preliminary Surveys of Sulphur and Cutbank Lakes - Peace River Region. 1
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Preliminary Surveys of Sulphur and Cutbank Lakes—Peace River Region

by Frank Bishop



Survey Report No.12

Alberta Fish and Wildlife Division
FISHERIES SECTION

1969-1970

1971-1972

Arctic Lake is the smallest lake in a series of three lakes that form the Sulphur River drainage. It is 1.5 km long and 0.5 km wide. It is situated on the 5th meridian. It is situated in a valley and is surrounded by a typical forest which is composed of spruce and poplar. The lake is usually a mirror in dry weather but when it is raining it is very muddy. It is situated at a distance of 100 km from the nearest town. There is an office for the Forest Service at the lake. The lake is situated on the 5th meridian.

PRELIMINARY SURVEYS OF
SULPHUR AND CUTBANK LAKES.

PEACE RIVER REGION

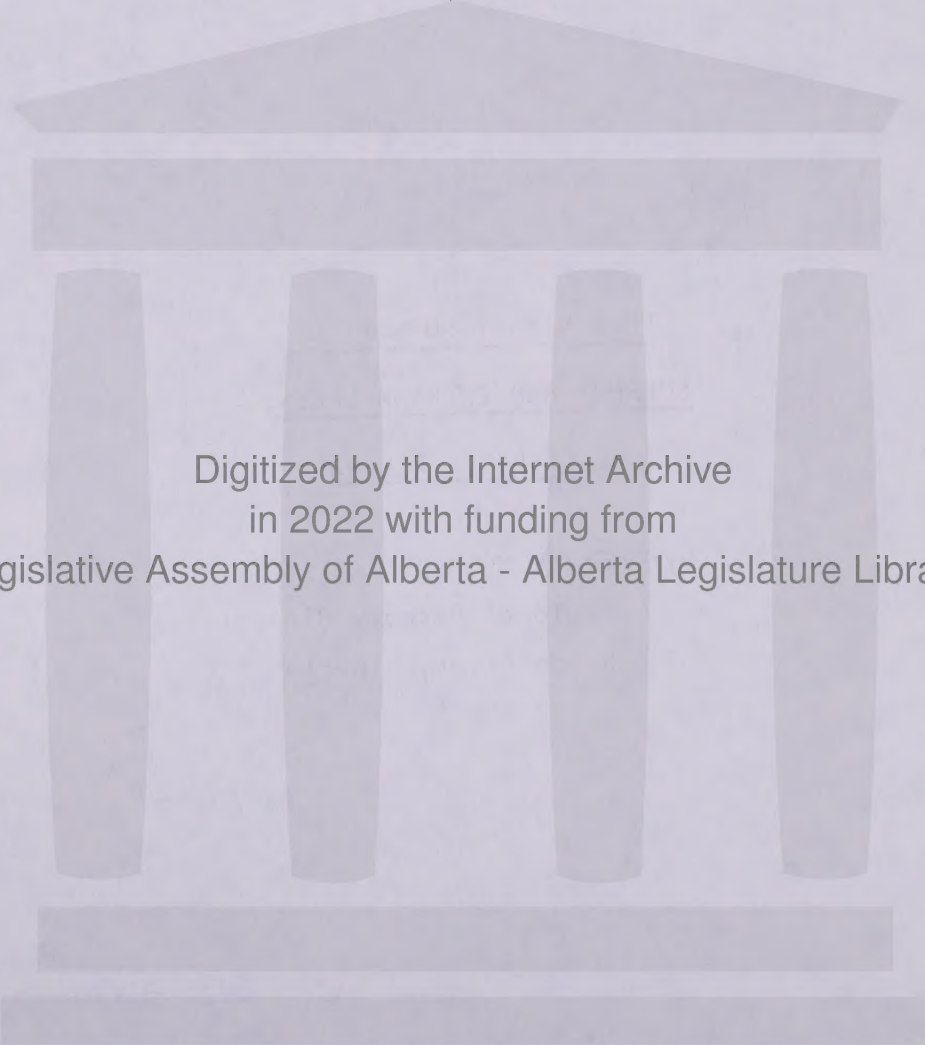
Sulphur Lake is a small lake in the Peace River region. It is 1.5 km long and 0.5 km wide. It is situated on the 5th meridian. It is situated in a valley and is surrounded by a typical forest which is composed of spruce and poplar. The lake is usually a mirror in dry weather but when it is raining it is very muddy. It is situated at a distance of 100 km from the nearest town. There is an office for the Forest Service at the lake. The lake is situated on the 5th meridian.

by: Frank Bishop
Regional Fishery Biologist
Peace River, Alberta

The lake was surveyed on March 20 and July 5 and 9, 1969.

Past history

The first biological survey of the lake was carried out in December, 1969, by Fishery Biologist R. J. Ferguson and Fish and Wildlife Officer A. R. Wilson. It was recommended at this time that the lake should be stocked with fish. The lake is situated in a valley and is surrounded by a typical forest which is composed of spruce and poplar. The lake is usually a mirror in dry weather but when it is raining it is very muddy. It is situated at a distance of 100 km from the nearest town. There is an office for the Forest Service at the lake. The lake is situated on the 5th meridian.



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Introduction

Sulphur Lake is the easternmost lake in a chain of three lakes that drain into the Whitemud River (Sections 7 and 12; Townships 2 and 3; Range 89, West of the 6th Meridian). It is situated in a valley and is surrounded by a typical boreal mixed wood forest composed of spruce and poplar. The lake is readily accessible in dry weather by means of a Forestry Road which runs westward from Dixonville, a distance of some 40 miles. There is an Alberta Forest Service campground located on the northeast shore of the lake.

Sulphur Lake has no permanent inlet streams and it's one outlet stream drains from the western end of the lake. The shoreline of the lake contains many stumps and dead willows, probably the result of flooding caused by beaver activity. The name "Sulphur" was apparently given to this lake because of the yellowish deposit found on the bottom of the creek in early years.

The lake was surveyed on March 26 and July 8 and 9, 1969.

Past History

The first biological survey of the lake was carried out in December, 1959, by Fishery Biologist R. J. Paterson and Fish and Wildlife Officer D. K. Weisser. It was recommended at this time that rainbow trout be stocked in the lake, even though a previous introduction of perch had just been made. Since the original survey, there has been very little biological work carried out on

the lake aside from some test nettings. Table 1 shows a summary of the fish plantings that have been made in the lake.

As can be seen, the lake has had a varied planting program. Little follow-up work had been carried out on the success of these introductions. In 1961 Weisser set test nets in the lake and caught a small number of trout, perch, and suckers.

It has been reported that in the 1930's the lake was "full of pike". At that time the outlet creek was not obstructed by beavers.

Morphometry

Sulphur Lake has a surface area of 128 acres. The maximum length is approximately 5,000 feet in a northwest - southwest direction. The maximum width is approximately 1,650 feet.

The lake is readily exposed to wind action from the west and northwest.

The volume of the lake has been calculated to be approximately 1,680 acre-feet. The mean depth of the lake is 13.1 feet and the maximum depth found was 25 feet. The shape of the lake's basin is close to being cone shaped (volume development - 1.6). There is very little shallow water except at the northwest and southeast ends, 61.3% of the lake being deeper than 10 feet. Emergent vegetation is found only at the ends of the lake in a few places along the north shore.

Physical and Chemical Features

Water samples were taken and analyzed on two occasions. The first sample was taken through the ice in March when conditions

TABLE 1
should be at their peak. The second sample was taken in July (see Figure 1 for location of sample). Results

FISH PLANTINGS IN SULPHUR LAKE -
1958 - 1966

<u>Year</u>	<u>Species</u>	<u>Amount</u>	<u>Size</u>
1958	Perch	3,000	--
1960	Rainbow Trout	61,500	fingerlings
1961	Rainbow Trout	97,200	fingerlings
1965	Perch	2,000	fingerlings
1966	Pike	250	adult

Sulphur Lake is only slightly alkaline, having a pH of about 7.5 in summer and 7.0 in winter. The alkalinity is primarily caused by bicarbonates. The phenolphthalein alkalinity is 5 ppm and the total (methyl orange) alkalinity is about 110 ppm, summer and winter.

In summer the lake water is medium hard (123 ppm CaCO_3), but by late winter the hardness has increased to 156 - 250 ppm CaCO_3 . Most of the hardness is due to calcium.

Conductivity, as measured by a Mech conductivity meter,

Physical and Chemical Features

Water samples were taken and analyzed on two occasions. The first sample was taken through the ice in March when conditions conducive to winterkill should be at their peak. The second sample was taken in July (See Figure 1 for location of samples). Results of the analyses are shown in Table 11. Water analysis was conducted using a Hach kit. pH was measured using a Hellige colour comparator.

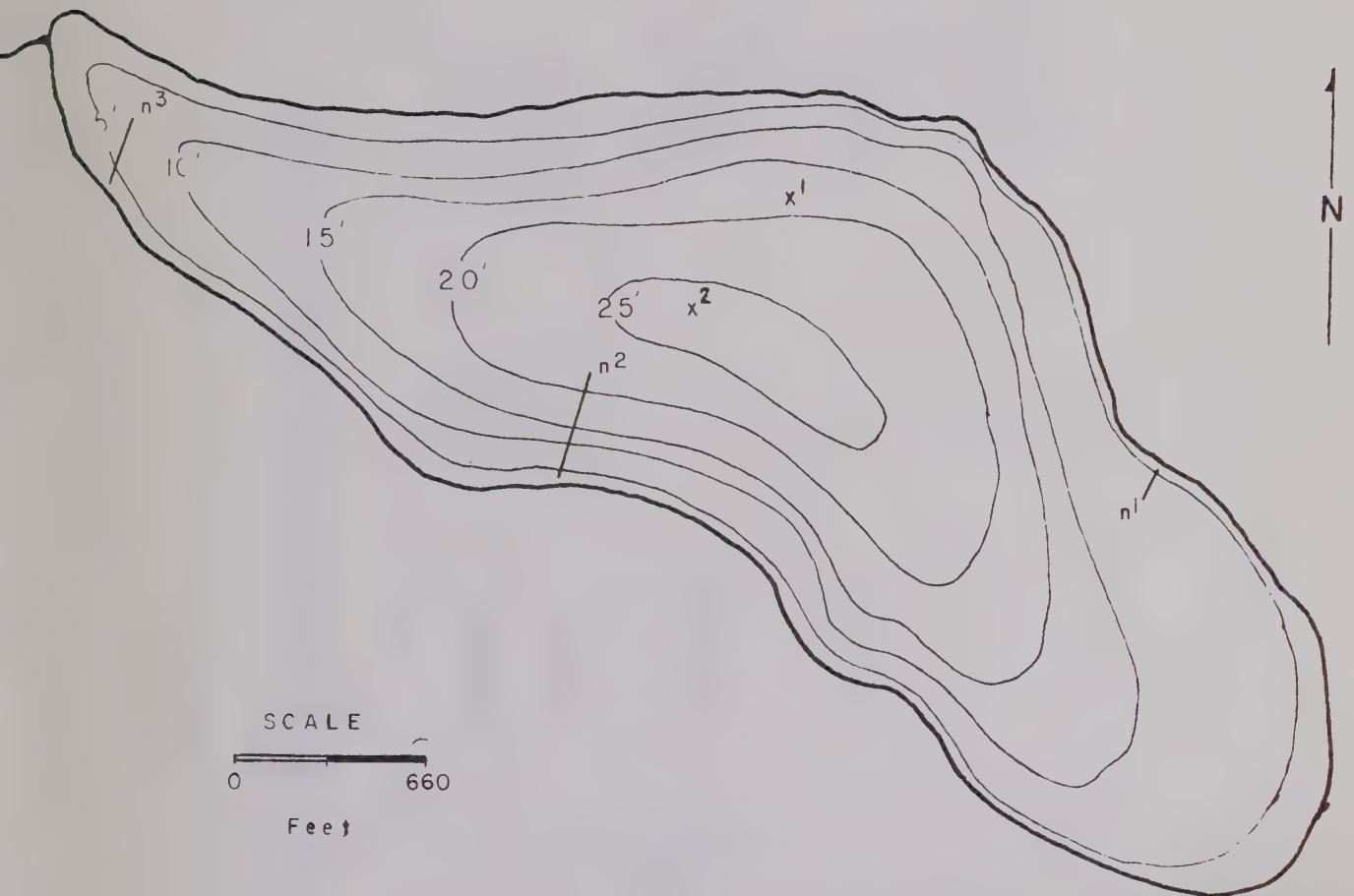
The greater variation in dissolved oxygen concentrations is undoubtedly caused by algae blooms which occur throughout the summer. In July the surface water was super-saturated with oxygen (120%), whereas the bottom was devoid of it. At a depth of 12 feet a 95% saturation was recorded. The effects of the fall overturn persist well into the winter, for even in March the dissolved oxygen at 19' was 9% of saturation, while the surface was about 40% saturated. In July a slight thermocline was apparent at about the 15 foot level.

Sulphur Lake is only slightly alkaline, having a pH of about 7.9 in summer and 7.0 in winter. The alkalinity is primarily caused by bicarbonates. The phenolphthalein alkalinity is 0 ppm and the total (methyl orange) alkalinity is about 120 ppm, summer and winter.

In summer the lake water is medium hard (123 ppm CaCO_3), but by late winter the hardness has increased to 156 - 250 ppm CaCO_3 . Most of the hardness is due to calcium.

Conductivity, as measured by a Hach conductivity meter,

SULPHUR LAKE



LEGEND

- x¹ Water Spl. March 26, 1969
x² " " July 9, 1969
n¹ = 1" & 2" nets
n² = 2" & 3" nets
n³ = 4" nets

Figure 1

Contour map of Sulphur Lake, showing locations of water samples and net sets.

TABLE 11

RESULTS OF WATER ANALYSES FROM SULPHUR LAKE IN 1969

	March 26		July 19	
	<u>Surface</u>	<u>Bottom</u>	<u>Surface</u>	<u>Bottom</u>
Dissolved oxygen	5 ppm	1.2 ppm	11 ppm	0 ppm
Phenolphthalein alkalinity (ppm CaCO_3)	-	-	0	0
Total alkalinity (ppm CaCO_3)	119.7	-	119.7 ppm	119.7 ppm
Calcium hardness (ppm CaCO_3)	-	-	80. ppm	-
Total hardness (ppm CaCO_3)	22.3 ppm	-	13.68 ppm	136.8 ppm
Chlorides	-	-	.5 ppm ¹	-
Nitrate Nitrogen	-	-	4. ppm	-
Nitrate Nitrogen	-	-	.002 ppm	-
Sulphate	-	-	52. ppm	-
Silica	-	-	.8 ppm	-
Copper	-	-	.1 ppm	-
Iron	-	-	.1 ppm	-
Turbidity	-	-	25. ppm	-
Specific Conductance	-	-	2.46 MicroMhos/cm	-
Water Temperature	-	-	19°C	9°C
pH	7.1	-	7.9	-

showed that the sodium chloride of the lake was at 120 ppm. This converts to a specific conductance figure of approximately 246 micro-Mhos/cm. This figure is about average for lakes in the Peace River Region.

Although transparency was not measured, the turbidity was measured at 25 ppm which indicates that the water can be classified as clear. Blue-green algae in the lake would cut down the transparency of the lake considerably.

Plankton

One vertical plankton haul was made on July 9, 1969 from a depth of 25 feet using a Wisconsin-type plankton net with a 5 inch diameter (No. 20 mesh nylon cloth). The most common occurring 200 plankton was Daphnia sp. Chaoborus and calanoid copepods were present, but in small numbers. Of the phytoplankton, the blue-green algae Aphanizomenon sp. existed in bloom conditions. Microcystis sp. and Coelosphaerium sp. were common and Gloetrichia sp. was rare. The green algae Volvox sp. also occurred only rarely.

Fish

(a) Netting Results

Nets of varying mesh size were set in three different locations on July 8 and 9, 1969. Locations of the sets can be seen in Figure 1. Table III shows the result of the test sets.

In addition to the test netting in Table III, three small perch (young of the year) were taken in a dip net.

TABLE 111

RESULTS OF TEST NETS SET IN SULPHUR LAKE, SET JULY 8, 9, 1969

Set #	Mesh Size	Length	Depth	Hours Set	Perch	White Suckers	Pike
Set #1	1"						
	2"	100 ft.	2' - 8'	2 hrs.	51	-	-
Set #2	2"	50 yd.	4' - 13'	15 hrs.	127	-	1
Set #2	3"	50 yd.	13' - 25'	15 hrs.	-	-	-
Set #3	4"	59 yd.	4' - 7'	15 hrs.	15	3	-
				Total:	193	3	1

Table III shows that all of the perch were caught in water shallower than 13 feet.

(b) Growth

Scale samples, weights, length and sex were taken from 78 of the perch and the scales were read and aged. The results are shown in Table IV.

From the evidence in Table IV it appears that there could have been a year class failure in 1966, as there are very few three-year old perch in the sample. It is apparent that female perch grow longer and heavier than males after the second year of life (Table IV and Figure 2). One would expect the females to be heavier due to the large ovaries, but they should not normally be much longer than the males.

(c) Maturity

Both sexes of perch mature in their second year in Sulphur Lake. Of the 32 two-year old perch, 25 of them were sexually immature and 7 of them mature. All the three and four-year old perch were sexually mature.

(d) Diet

Fifteen stomachs were examined for contents. Of these, three were empty. The most commonly found food item was Chironomid (midge) pupae. Other items, in descending order of importance were Hyallela azteca, leeches, Gammarus sp., Chaoborus sp., and mayfly larvae.

TABLE 1V

AVERAGE LENGTHS AND WEIGHTS OF 78 PERCH FROM SULPHUR LAKE, 1969

Age	No.	Sexes Combined			Oz.	Males			Females		
		Length Cm.	In.	Weight Gm.		Length Cm.	No.	Weight Gm.	Length Cm.	No.	Weight Gm.
0	3	2.8	1	4	-	-	0	-	-	-	-
1	1	13.9	5.4	40.0	1.4	-	0	-	13.9	1	40.0
2	32	16.4	6.5	70.9	2.5	16.1	14	67.1	16.7	18	73.9
3	7	23.9	9.4	230.0	8.1	23.4	4	225.0	24.6	3	236.7
4	33	26.2	10.3	330.0	11.7	24.2	15	242.7	27.9	18	402.8
5	2	30.8	12.2	530.0	18.7	-	0	-	30.8	2	530.0
78		33				42					

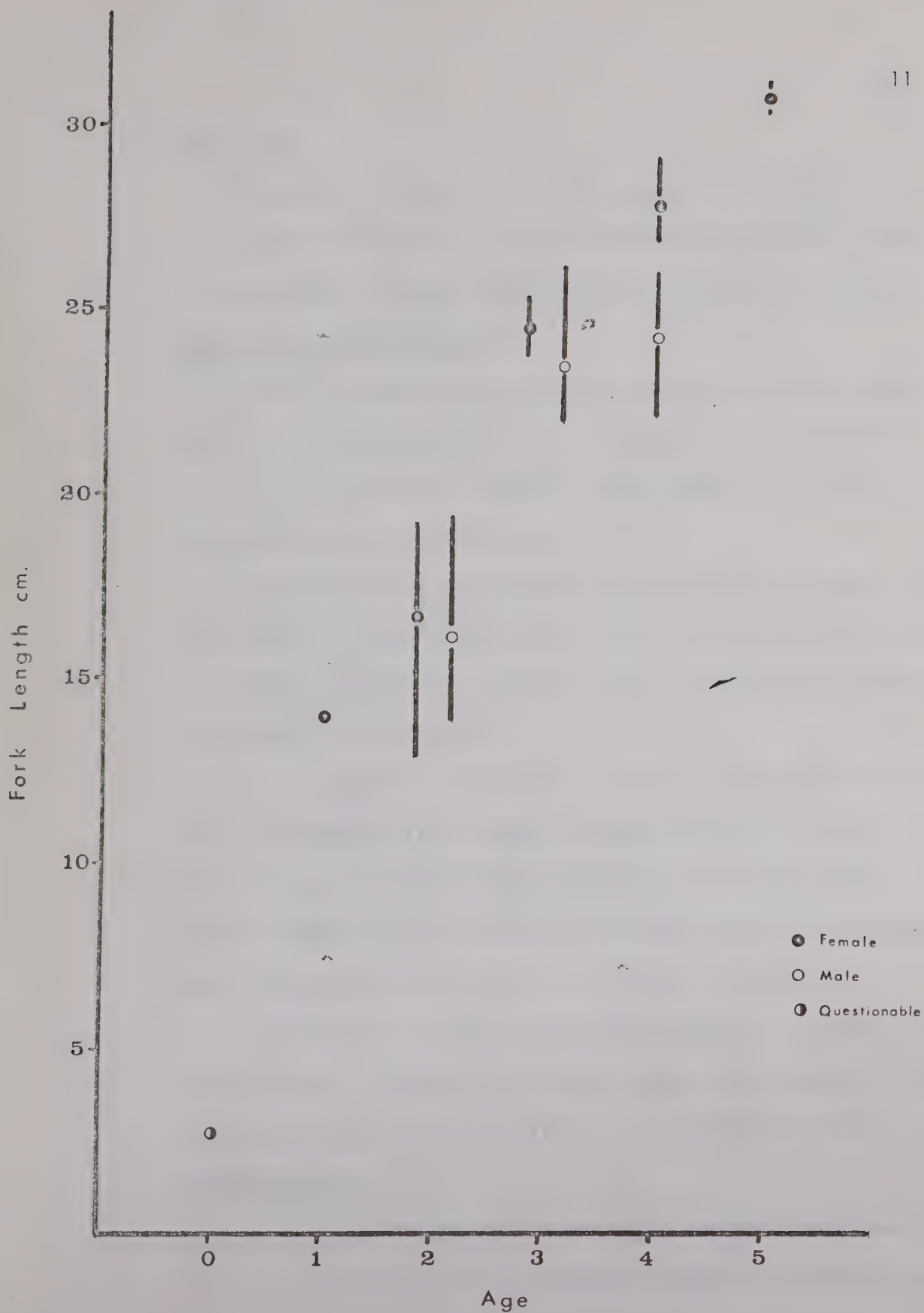


Figure 2:

Growth rate of Perch from Sulphur Lake. Thin line denotes range. Circles denote mean fork length.

(e) Other fish

The one pike caught was an immature male, two years old. The three white suckers were all female and all mature. One of the suckers was egg-bound and had not spawned this year.

Discussions and Conclusions

It is evident that Sulphur Lake is now primarily a perch lake. The perch population in the lake appears to be healthy - there is no evidence of stunting, food appears to be plentiful, and the perch are reproducing well.

The former trout population appears to be very small and there does not seem to be a much larger sucker population. The small pike population is probably due to the fact that there is little emergent vegetation.

It is possible that Sulphur Lake may winterkill in certain years, especially if it does not receive a good turnover in the fall. A poor turnover would mean that the already oxygen-depleted deeper waters would not be replenished with oxygen and thus the lake as a whole would suffer during the winter.

At present the lake level is maintained by a beaver dam on the outlet. A reduction in lake level, even temporary, would cause the frequency of winterkills to increase markedly.

Recommendations

1. The perch population should be watched for signs of stunting and if this occurs, another introduction of

pike should be made into the lake to try to reduce the number of perch.

2. It would be advantageous to have some sort of permanent dam on the outlet creek in order that the water level could be maintained and controlled.

Acknowledgements

I would like to thank Fish & Wildlife Officer Gary E. Morton and my summer assistant Gary Mann for all their assistance in the field.

Addendum

Reports were received in May, 1970 that Sulphur Lake had suffered a winterkill. On May 21, Fish & Wildlife Officer Ben Covey and Gary Mann set 50 yards each of $2\frac{1}{2}$ inch and $3\frac{1}{2}$ inch gill net and 50 feet each of 2 inch, 3 inch, and 4 inch mesh nets for a period of three hours. No fish were caught in the nets, but many rotting fish were seen on the bottom and on shoreline. It was evident that the lake had suffered a severe winterkill.

Introduction

Cutbank Lake is a fairly popular lake located 19 miles northwest of Grande Prairie. It is primarily utilized for angling. It is located in Sections 23, 26, and 27 of Township 72, Range 8, West of the 6th Meridian. The land surrounding the lake has mostly been cultivated, but a few trees remain immediately adjacent to the lake.

Cutbank Lake has no permanent inlet or outlet streams. No boat launching facilities or beach areas have been developed at the lake to date.

Cutbank Lake was investigated on May 20, 1969 primarily to determine the severity of a winterkill situation which occurred a few months earlier.

Past History

Cutbank Lake was first investigated in 1952 by Miller & Paetz and it was then recommended that the lake be planted with perch. Since the original survey, there has been little biological work carried out, but test nets have been set on a number of occasions. Table 1 lists the introductions known to have been made at this lake.

Morphometry:

The contours of Cutbank Lake are shown in Figure 1. The map was constructed from soundings taken by hand line on May 20, 1969.

CUTBANK LAKE

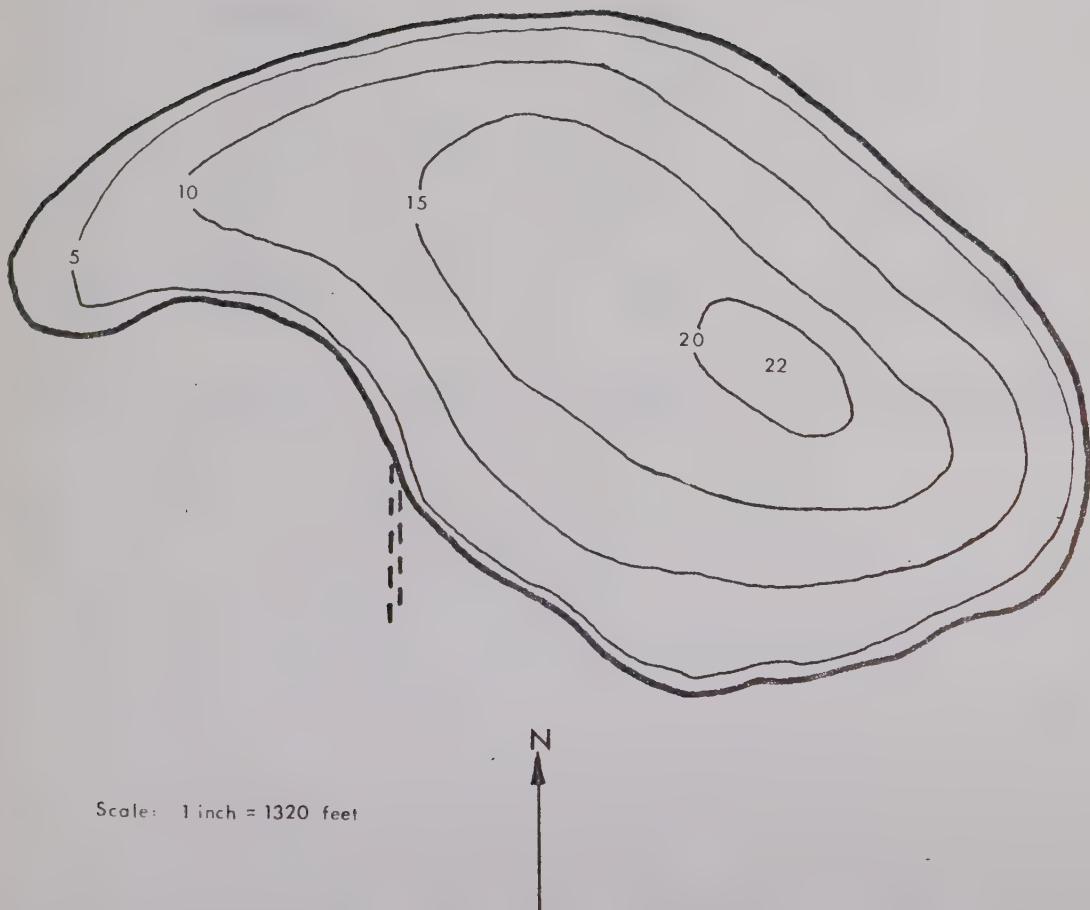


Figure I

Contour map of Cutbank Lake.

TABLE 1

RECORD OF FISH INTRODUCED TO CUTBANK LAKE

<u>Year</u>	<u>Species</u>	<u>Amount</u>	<u>Size</u>
1952	Perch	3,500	Fingerlings
1957	Pike	850,000	Eyed-eggs
1958	Perch	3,500	Fingerlings
1963	Perch	6,000	Fingerlings

The lake has a surface area of 425 acres. It's maximum length is approximately 7,260 feet (1.37 miles) in a west-east direction and it's maximum width is approximately 4,620 feet (0.87 miles). The lake is readily exposed to the prevailing westerly winds.

The volume of the lake has been calculated at 4,944 acre-feet. The mean depth of the lake is 11.6 feet and the maximum depth found was 22 feet. The lake's basin is relatively cone-shaped (volume development of 1.6). About 61% of the lake is deeper than 10 feet.

Physical and Chemical Features

A limited water analysis was carried out using a Hach kit. pH was taken using a Hellige colour comparator. Results are shown in Table 11.

The water in Cutbank Lake is similar to that found in other lakes, in the Peace River Region, being fairly alkaline and medium hard. The dissolved oxygen readings were fairly low at the bottom, but as this lake has a history of winterkill, it was perhaps not surprising at this season. Oxygen readings taken in April, 1964 showed the presence of only 1.8 ppm of dissolved oxygen at the bottom and 4.6 ppm at the surface. There was 30 inches of ice at this time.

The Secchi disc reading indicates that the water is fairly turbid.

TABLE 11

WATER ANALYSIS OF CUTBANK LAKE, MAY 20, 1969

	<u>Surface</u>	<u>Bottom (20')</u>
Dissolved oxygen	8 ppm	4.5 ppm
Phenol alkalinity	17.1 ppm	--
Total alkalinity	256.5 ppm	--
Total hardness	136.8 ppm	--
Free CO ₂	--	--
pH	7.4	--
Water temperature	12.5°C	--
Secchi disc	5.5 feet	10.7°C

Bottom Samples

Two bottom samples were taken using a 6" x 6" Ekman dredge, one from the 20 foot level and one from the 11 foot level. The samples were washed in a screened bucket (29 meshes per inch). The results are as shown in Table III.

Chironomid larvae (midges) were the most abundant organisms found, both by numbers and by weight. The high numbers of these larvae indicate that Cutbank Lake contains an abundant food supply for the smaller species of fish. The bottom material in both areas consisted of mud and much organic detritus.

Plankton

One vertical plankton haul was made from a depth of 20 feet using a Wisconsin-type plankton net with a 5" mouth diameter (No. 20 mesh nylon cloth). Most of the 1.2 c.c. of settled material obtained was composed of 200 plankton. The most commonly occurring organisms were: Cladocera (*Daphnia* spp); Copepoda (adults and nauplii) and Rotifera (Keratella). The blue-green algae, Aphanizomenon, was found in very small numbers.

Fish

The main purpose of this test was to determine whether or not there had been a significant winterkill. Many dead perch (Perca flavescens) and white suckers (Catostomus commerson) could be seen on the east shore where they had been blown by the wind. Two 50 foot monofilament nylon gill nets of 2" and 3" mesh, stretched measure,

TABLE III

SUMMARY OF ABUNDANCE OF BOTTOM FAUNA FROM
CUTBANK LAKE - MAY 20, 1969

<u>Organisms</u>	<u>No. /m²</u>	<u>Wt. /m²</u>
Chironomidae	2775.0	11.1 gm
Mollusca	607.0	1.8 gm
Oligocnaeta	66.6	---
Trichoptera	22.2	---
Hirudinea	22.2	---

were set for $2\frac{1}{2}$ hours in water six feet to 14 feet deep. The 2" net, set in shallower water, caught 41 perch and 2 pike and the 3" net caught one perch.

The results of aging of the 42 perch caught are shown in Table IV. These data show that the female perch are growing faster than the males, but that the combined growth rate is not very rapid. It is quite likely that a large population of perch was present and that the partial winterkill in the spring of 1969 did more good than harm. Almost all the perch collected appeared to be immature.

The largest of the two pike (Esox lucius) caught was 57.0 cm. in length and weighed 1,260 grams (22.4 inches and 2.8 pounds).

Stomach Analysis

Most of the perch had full stomachs and an analysis of the contents of six of them revealed that they were eating Chironomid pupae. Each stomach contained close to 1 c.c. of these pupae, a not surprising quantity when one considers the numbers of chironomid larvae found in the bottom samples.

Diseased perch:

A number of perch suffering from open sores and tumors on the body and fins were collected from Cutbank Lake in 1968 and 1969. One of these fish was sent to Mr. Ron Sonstegard at the University of Guelph, who identified the disease as lymphocystis, a virus disease which causes benign (non-malignant) tumors in a wide variety of fish.

TABLE IV

LENGTHS AND WEIGHTS OF PERCH FROM CUTBANK LAKE, MAY, 1969

Age	No.	Males			Females			Combined		
		Length (mm)	Weight (gm)	No.	Length (mm)	Weight (gm)	No.	Length (mm)	Weight (gm)	No.
III	6	166.5	59.2	4	178.3	82.5	10	171.2	68.5	
IV	17	179.2	82.6	6	190.7	105.0	23	182.2	88.5	
V	6	191.2	100.0	3	207.3	123.3	9	196.5	107.7	

The disease is generally not considered to be a hazard to public health, nor does it pose a real threat to the life of the fish that is infected. It may, however, have some effect upon the growth rate of individual fish.

Conclusions and Recommendations

The results of the latest investigation show that in 1969 perch were plentiful in number, but small in size. It is possible that the perch were over-populated in 1968, prior to a partial winter-kill in 1969. Pike did not seem to be very numerous, probably because of the absence of suitable spawning habitat.

It is recommended that a proper boat launching site be built in order that the lake can be better utilized by anglers.

Acknowledgements

I would like to thank Fish and Wildlife Officers R. Sjovald and F. Cardinal and my summer assistant Gary Mann, for their assistance.

